ORIGINAL COMMUNICATIONS

EMBRYO TRANSFER IN VIVO

John F.J. Clark, MD, FACOG
Washington, DC

Records of 44 patients with advanced ectopic pregnancy were reviewed. The author demonstrates that in vivo embryo transfer can reimplant later than one week of gestation and that implantation does not require endometrium as the only implantation site. Other tissues and organs can support implantation, but adequate hormonal secretion is necessary.

In the late 1970s, certain physicians and researchers successfully performed in vitro fertilization and embryo transfer on human subjects. It is hoped that this procedure will prove to be one solution for infertile women with irreversible tubal damage.

Another natural phenomenon that is as old as medical history is a form of in vivo embryo transfer. The pathological conditions of tubal abortion, tubal rupture, or a defect in the uterine wall with reimplantation have some interesting findings when compared with embryo transfer following in vitro fertilization.

Mukhergee[1] stated that successful in vitro fertilization and embryo transfer required four components: (1) viable gametes, (2) suitable culture media to sustain growth and cleavage of the resulting embryo, (3) an appropriate uterine environment for implantation of the blastocyst, and (4) a suitable technique for transfer of the embryo from the culture to the uterus.

In vivo embryo transfer from previous ectopic pregnancy will emphasize some similarity in all of these areas and dramatize the significance of the latter two. The importance of an appropriate uterine environment was highlighted by Soupart: "The embryo waits for the emdometrium but the endometrium will not wait for the embryo."[2] This might be true for in vitro fertilization but not a truism for this type of in vivo fertilization with embryo transfer. In fact, in some of these ectopic pregnancies the necessity for a uterus is questionable.

These factors dealing with embryo transfer following ectopic gestation bring forth some interesting concepts, such as: age of embryo at transfer, oxygenation of the environment, reimplantation after chorionic tissue has been separated partially or totally, blood supply and oxygenation to the secondary site of attachment of chorionic tissue, and the necessity for a corpus luteum and endometrium.

From the Department of Obstetrics and Gynecology, Howard University College of Medicine, and Howard University Hospital. Requests for reprints should be addressed to Dr. John F.J. Clark, Department of Obstetrics and Gynecology, Howard University Hospital, 2041 Georgia Avenue, NW, Washington, DC 20060.

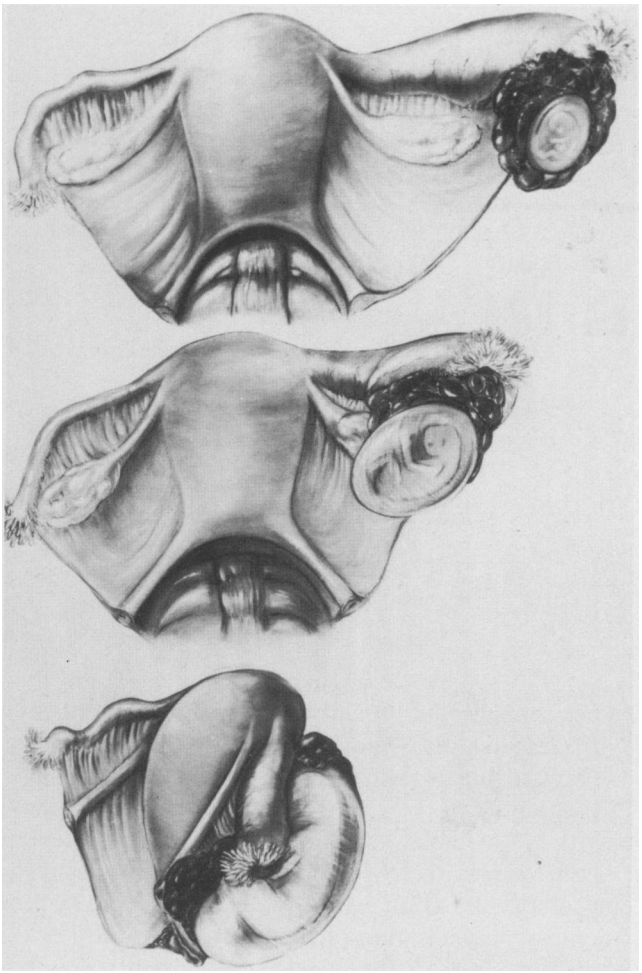

Figure 1. In Group A abdominal pregnancies, the placenta is located posterior to the uterus or in the cul de sac. From Clark JFJ, Bourke JA: Advanced ectopic pregnancy. Am J Obstet Gynecol 1959; 78: 340-350

METHODS AND RESULTS

Records were reviewed of 44 cases of advanced ectopic pregnancy which occurred from 1947 to 1977 at Howard University Hospital.

All of the 44 cases were of the secondary abdominal type. The cases were divided into three categories using the site of placental implantation as the key to the pathogenesis of the abdominal pregnancy (Group A, tubal abortion; Group B, tubal rupture; and Group C, rupture or perforation of the uterus).[3-5]

In Group A, the placenta was located posterior to the uterus or in the cul de sac, being carried there by gravity after the conceptus was expelled from the fallopian tube (Figure 1).

In Group B, the placenta was usually located on the uterine fundus or superior portion of the tube. Implantation may occur on the bladder, mesentery of the intestine, the viscera generally and the omentum (Figure 2).

In Group C, the fetus was extruded into the abdominal cavity through a rent in the uterus. The placenta in these cases would be in the uterine cavity or in the margins and surfaces of the perforation (Figure 3).

Twenty of the 44 advanced ectopic pregnancies revealed evidence of acute abdomen which was misdiagnosed initially. The most common erroneous diagnoses found in these cases were: threatened abortion, incomplete abortion, pernicious vomiting of pregnancy, and pelvic inflammatory disease associated with intrauterine pregnancy. The symptoms of intratubal or extratubal rupture occurred from five weeks to ten weeks (Table 1).

DISCUSSION

Advanced ectopic pregnancies that were secondary to tubal pregnancy or from a rent in the uterus have progressed through the four phases described by Mukhergee.[1] In the 20 patients who had the symptoms, reimplantation occurred from five weeks to ten weeks (Table 1). This showed chorionic tissue to be very adaptable in relocating on various sites. The new placental sites comprise the peritoneum, fallopian tube, ovary, omentum, intestinal serosa, myometrium, and endometrium with the fetus outside the uterus.

Twenty-eight weeks gestational age, or longer, was used as an index to demonstrate the presence of a good environment to support a growing fetus. All 44 patients were reviewed to see how many progressed to 28 weeks or more (Table 2).

The author did not use a viable infant at birth as a criterion for reimplantation because many cases had been misdiagnosed earlier. If earlier correct diagnoses had been made, an increased number of live infants would have been delivered.

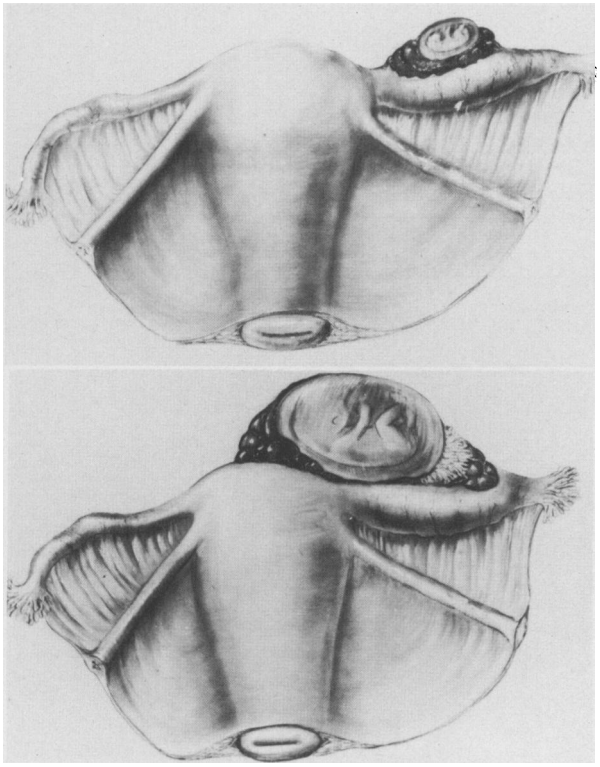

Figure 2. In Group B, the placenta is located on the uterine fundus, on or inside the tube, or on the intestines. From Clark JFJ, Bourke JA: Advanced ectopic pregnancy. Am J Obstet Gynecol 1959; 78: 340-350

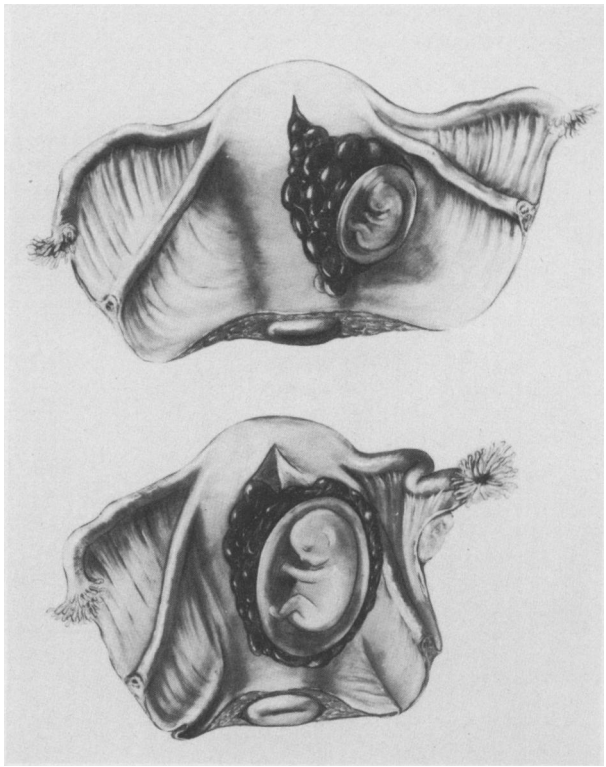

Figure 3. In Group C, the fetus is extruded into the abdominal cavity through a rent in the uterus. From Clark JFJ, Bourke JA: Advanced ectopic pregnancy. Am J Obstet Gynecol 1959; 78:340-350

TABLE 1. TWENTY CASES EXHIBITING EARLY SIGNS AND SYMPTOMS OF INTRA-ABDOMINAL ACCIDENT AND PROGRESSING TO ADVANCED ECTOPIC PREGNANCY

Group/ Case No.	Gestational Age of Intra-Abdominal Accident (weeks)	Gestational Age at Delivery (weeks)
Group A		
1	10	28
2	8	40
3	6	15
4	5	20
5	10	16
6	6	22
7	7	15
Group B		
8	8	14
9	8	17
10	5	12
11	9	14
12	9	36
13	10	23
14	8	25
15	5	16
16	8	20
Group C		
17	8	34
18	8	31
19	10	40
20	10	40

TABLE 2. FORTY-FOUR CASES OF ADVANCED ECTOPIC PREGNANCY WITH PERIODS OF GESTATION AND NUMBER OF VIABLE BIRTHS SUBDIVIDED ACCORDING TO PATHOGENESIS

	Group A	Group B	Group C
Gestational age			
12-20 weeks	5	4	0
20-28 weeks	10	3	4
28-40 weeks	5	7	6
Total	20	14	10
Live births	2	4	3
(gestational age, wk)	(38, 40)	(34, 34, 36, 40)	(40, 40, 40)
Percentage past 28 weeks	25	50	60
Percentage of live births	10	28	30

There were 18 cases that progressed beyond 28 weeks gestation in the three groups. Group C had the highest number (60 percent), with 30 percent live births. Group B had the next highest number, and Group A had the lowest.

Group C had the highest incidence of fetuses greater than 28 weeks of gestation because of a more adequate supply of blood from the moymetrium and endometrium. Group A had the lowest incidence because of placental attachment to the posterior leaf of the broad ligament, serosa, and fallopian tubes. Thus a minimum of blood vessels was available to support the placental attachment.

Usually, embryo transfer in vitro is approximately three days. Our records on 20 patients showed that these transfers occurred much later. Our cases showed that a viable embryo and trophoblastic tissue will reimplant and continue to grow if there is a functional corpus luteum, adequate blood supply to the new placenta site, and a suitable environment which varied from uterus, fallopian tube, intestine, and peritoneum. Also demonstrated was the multipotentiality of the celomic epithelium.

These cases emphasize the importance of the corpus luteum. In extracorporeal fertilization and embryo transfer, some difficulties have arisen with maintaining a functional corpus luteum and receptive endometrium.

Normally, the human preimplantation embryo enters the uterus approximately 72 hours after ovulation. It seems as if all of these in vivo ectopic transfers were much older than one week. Use of acute symptoms of intra or extra tubal rupture as the barometer of separation of initial implantation is a rough guideline. However, it does denote that partial or total separation occurs with chorionic tissue.

SUMMARY

This review of cases questions the absolute value of implantation in the endometrial cavity. The cases demonstrated that fetal reimplantation and growth did occur in Types A, B, and C.

Literature Cited

1. Mukhergee AB, Schulman JD. Can in vitro embryogenesis revolutionize management of infertility? Contemp Ob/Gyn 1980; 15:77-92.

2. Soupart P. In vitro fertilization and embryo transfer, Part 2. Curr Probl Obstet Gynecol 1979; 3:1-43.

3. Clark JFJ, Bourke J. Advanced ectopic pregnancy. Am J Obstet Gynecol 1959; 78:340-350.

4. Clark JFJ, Guy RS. Abdominal pregnancy. Am J Obstet Gynecol 1966; 96:511-520.

5. Clark JFJ, Jones SA. Advanced ectopic pregnancy. J Rep Med 1975; 14:30-35.